



Center *for an*
Urban
Future

New York's New Jobs Engine

The tech sector is powering the city's economic recovery and producing the lion's share of new well-paying jobs. However, several new competitive threats have the potential to dampen the industry's future growth.

Center *for an* Urban Future

New York's New Jobs Engine is a publication of the Center for an Urban Future and Tech:NYC. Researched and written by Billy Richling with Jonathan Bowles. Edited by Eli Dvorkin. Additional research by Charles Shaviro, JT Ennis, and Sophia Annabelle Klein. Designed by Stislow Design.

Center for an Urban Future (CUF) is a leading New York City-based think tank that generates smart and sustainable public policies to build a stronger and more equitable economy.



Tech:NYC is an engaged network of tech leaders working to foster a dynamic, diverse, and creative New York. We bring together New Yorkers to support a successful technology ecosystem, attract and retain top-tier talent, and celebrate New York and the companies that call it home.

CUF Staff & Board

EXECUTIVE DIRECTOR

Jonathan Bowles

EDITORIAL & POLICY DIRECTOR

Eli Dvorkin

EVENTS AND OPERATIONS MANAGER

Stephanie Arevalo

EDITOR

Charlotte Crowe

RESEARCH AND MULTIMEDIA SPECIALIST

Melissa Lent

DATA RESEARCHER

Charles Shaviro

BOARD OF DIRECTORS

Gifford Miller (Chairman)

Margaret Anadu

Jonathan Bowles

Michael Connor

Russell Dubner

Garnesha Ezediaro

Lisa Gomez

Jalak Jobanputra

Kyle Kimball

Katy Knight

Jessie Lazarus

David Lebenstein

Eric S. Lee

Monisha Nariani

Max Neukirchen

Andrew Reicher

John Siegal

Thomas Vecchione

Table of Contents

New York's New Jobs Engine

New York's New Jobs Engine.....	1
Emerging Areas of Growth in NYC's Tech Ecosystem.....	10
No Time to Rest: Rising Competition and New Headwinds Present Policymakers With Challenges	17
Data from New York's New Jobs Engine.....	21
Recommendations: Strengthening the Tech Sector as NYC's New Jobs Engine.....	25

New York's New Jobs Engine

IT WAS ONLY ABOUT 15 YEARS AGO WHEN THE TECH SECTOR BEGAN ITS METEORIC RISE AS A MAJOR

new economic force in New York City. Although the city had a foundation of tech companies well before this point the period from 2007 to 2012 saw a remarkable wave of new start-ups, the development of a strong local ecosystem, and faster growth in venture funding than any other city or region.

Today, the city's tech sector has not only continued its explosive growth and cemented its status as the nation's second-largest tech hub, behind San Francisco. It has reached a new level of importance to New York's economy, becoming the city's most dependable economic engine and reliable source of new well-paying jobs.

The tech sector now accounts for 5.2 percent of the city's total private sector employment, double its share from 2010 (when it made up 2.6 percent).

Since 2010, the city's tech sector added 114,000 jobs, a growth rate of 142 percent.¹ Remarkably, the tech sector accounted for 17 percent of the city's entire job growth during this period (114,000 out of 686,000 total jobs added).

During this period, employment in the tech sector grew more than seven times as fast as the city's overall economy (which increased 19.1 percent). The tech sector added jobs at a faster clip than nearly every other industry, growing 17 times as fast as the city's finance and insurance sector (which increased by 8.4 percent), nearly 5 times the rate of the advertising field (+29.7 percent); more than 3 times the rate of healthcare (+46.1 percent), and more than twice as fast as the film and TV sector (+60.8 percent). Tech was also one of the city's fastest-growing sectors in both the decade prior to the pandemic and since the onset of COVID-19.

At a time when New York City still has 173,000 fewer jobs than it did before the start of the pandemic, the tech sector will be crucial to igniting a long-term post-pandemic jobs recovery. New York is already well positioned in many of the emerging tech sub-industries poised for growth. Our detailed analysis of data from Crunchbase shows that the city has experienced start-up growth of at least 50 percent in ten different tech fields since 2016—from blockchain and real estate tech to women's and family tech, artificial intelligence, and augmented reality.

If New York succeeds in capturing a large share of the industry's future growth, it can benefit a diverse mix of New Yorkers. Black and Hispanic New Yorkers already make up 20.8 percent of New York's tech sector workforce, compared to 8.5 percent in the San Francisco Bay Area and 9.7 percent in the Boston/Cambridge area.² This level of representation is still far from where the sector should be in reflecting the diversity of New York's population, and this report includes several recommendations for significantly expanding access to tech careers. However, our research also reveals that more private and public efforts are underway than ever before to diversify tech employment in New York and build stronger pathways into well-paying tech jobs.

Despite this enormous potential, the tech sector's long-term sustainable growth in New York is by no means assured. While industry leaders and start-up founders interviewed for this report were almost uniformly bullish on the city, several still-evolving economic trends could dampen New York's growth. Chief among them is the rise of remote work, which has made it easier than ever for tech workers—and the companies that employ them—to locate elsewhere.³ Moreover, this trend is happening while Miami, Austin, Nashville, and several other cities that offer comparatively affordable real estate—and budding tech ecosystems of their own—are making plays to poach companies and talent from the five boroughs. The departure of several tech companies from San Francisco since the pandemic arrived is a cautionary tale for what could happen here, as unlikely as many New York-based tech leaders believe that to be.⁴

New York can overcome these and other challenges to build a larger, more sustainable, and more inclusive tech ecosystem. But it is unlikely to happen without renewed support from city leaders.

Researched and written by the Center for an Urban Future (CUF) in partnership with Tech:NYC, this report examines the emergence of New York's tech sector over the past decade into one of the two or three most important parts of the city's economy; details the core strengths and emerging competitive advantages of the city's start-up ecosystem in recent years; analyzes which tech subsectors in New York offer the most potential for future growth; and identifies critical challenges that city leaders will need to address in order to ensure the sector's long-term growth.

The report is a ten-year update of CUF's landmark 2012 study, *New Tech City*, which provided the first comprehensive analysis of the tech sector's rise in New York. It draws from an extensive analysis of public and private data on tech start-ups, industry employment, and venture capital (VC) funding, and from interviews with more than 50 start-up founders and tech industry leaders, venture capitalists and investors, economic development experts, civic technologists, incubator and accelerator leaders, and other experts from across the city's tech ecosystem and around the country. The report concludes with a set of practical recommendations for policymakers and business leaders to ensure the continued sustainable growth of this sector and maximize the benefits for all New Yorkers.

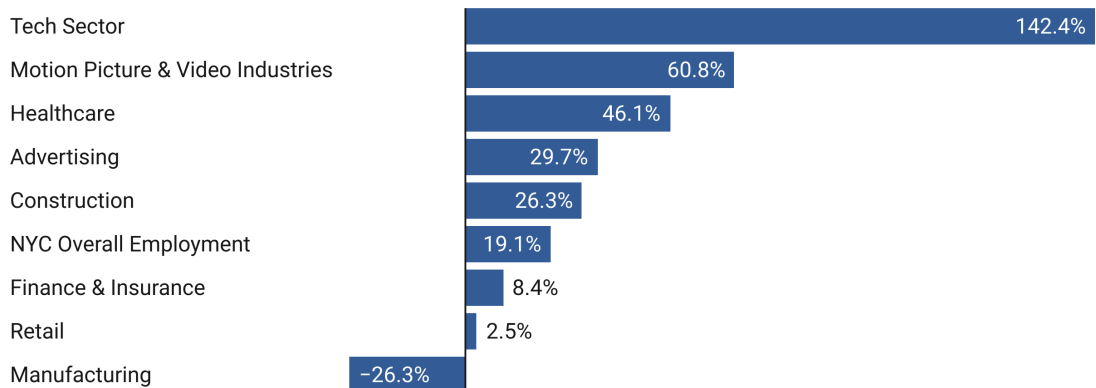
The New Engine of NYC's Economy—and New Driver of Good Jobs

Tech isn't yet New York City's largest industry. With 575,000 jobs in the city, healthcare has far more jobs than any other part of the economy. But tech has become New York City's new engine of job growth.

The city's tech sector added 114,000 jobs since 2010—going from 80,020 jobs in 2010 to 193,929 in December 2021.⁵ And our analysis almost certainly undercounts the true size of tech employment in New York, since this report uses the Federal Reserve Bank of New York's narrow definition for measuring employment in the tech sector—one that doesn't include tens of thousands of additional tech workers employed at banks, hospitals, and in other non-tech industries.⁶ (Other analyses have found that when all of these other technology jobs are included, the city's tech ecosystem employs 372,000 people.)

While the tech sector overall grew by 142 percent during this period, the slice of the industry focused on web content and services ("Internet publishing and web search portals") grew by a whopping 567 percent—increasing by nearly 44,000 jobs, from 7,737 positions in 2010 to 51,619 in December 2021. The "software publishing" sub-sector, which includes companies developing applications and computer software, saw even more meteoric growth,

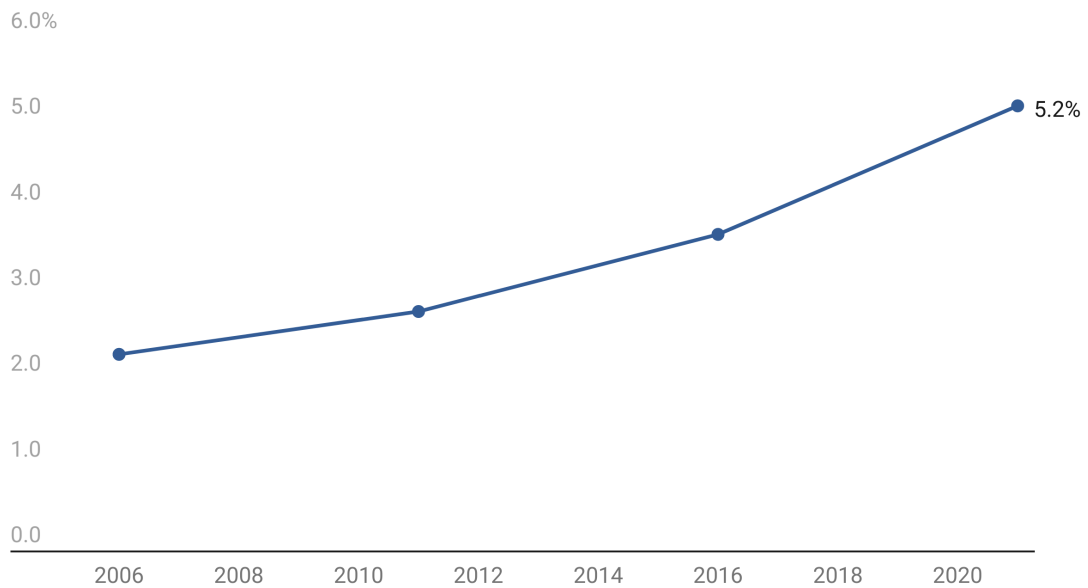
Tech Sector Outpacing Other Major Industries in NYC Job Growth, 2010–2021



Source: Center for an Urban Future analysis of Quarterly Census of Employment and Wages data for 2010 through December 2021.

Created with Datawrapper

Tech Sector Share of NYC Private Employment



Source: Center for an Urban Future analysis of Quarterly Census of Employment and Wages data for 2006 through December 2021.

Created with Datawrapper

going from 1,586 jobs in 2010 to 24,328 at the end of 2021, an increase of 22,742 jobs (or 1,434 percent).

In addition to raw job growth, the tech sector has also become the city's most reliable source of new middle- and high-wage jobs—an important development across a decade in which New York City added more jobs paying less than \$50,000 annually than those paying more than \$80,000 annually. While the tech sector added 114,000 mostly well-paying jobs since 2010, other industries that had been among the most dependable creators of good jobs in previous decades produced much less growth. For example, during this same period, hospitals added 3,800 new jobs; the construction industry registered a net gain of 28,600 jobs; the securities industry added 17,000 jobs; law firms added 3,000 jobs; and manufacturing actually shed 19,700 jobs.

Our analysis of data from the New York State Department of Labor shows that tech sub-industries accounted for a disproportionate share of the fastest growing industries in the city over the past decade—and nearly all the fast-growing industries that pay at least \$80,000 annually. In fact, four of the ten fastest

growing sub-industries were in tech. And of the five fastest-growing fields that pay average wages of at least \$80,000, four are in tech. (Among the six industries in which employment more than doubled during this time, three pay more than \$80,000 annually—and all three are in tech. Of the other three fastest-growing industries, home health care services pays average wages of just \$30,800, warehousing & storage has average wages of \$37,800, and the employment services sector pays \$69,500.)

The tech sector has also been among the city's few economic bright spots during the pandemic. Between February of 2020, the month before the pandemic, and December 2021, private sector employment in the city declined by 5.3 percent and most major industries suffered declines, including healthcare (which had a 0.4 percent decline in jobs), finance (-2.3 percent), and retail (-8.6 percent). During the same period, jobs in the city's tech sector increased by 8.7 percent.

Some tech sub-industries barely slowed down during the pandemic, with employment in the “software publishers” industry growing by 17.5 percent between February 2020 and December 2021 and the

“Internet publishing and web search portals” field growing by 14.6 percent. In May 2022, there were a staggering 1,338 open jobs at Google that offered the New York campus as a work location.

A Much Larger and More Sustainable Tech Ecosystem

There are now 25,451 tech-enabled startups in New York City, according to our analysis of data from Crunchbase, a leading global database that tracks tech-enabled start-ups using a mix of public, private, and self-reported sources. This represents an incredible 145 percent increase from a decade ago, when there were 10,389 start-ups in the city.⁷

In addition to this spike in new start-ups, the past decade saw scores of tech companies experience exponential growth—transforming a sector that had previously been known primarily for thousands of small and mid-sized start-ups to one that now boasts many larger tech companies. For example, the average firm in the city’s “Internet publishing and web search portals” subsector increased in size from 18 employees in 2010 to 58 employees in 2020.⁸

Meanwhile, several of the nation’s largest tech companies have doubled down on New York, adding thousands of new positions in the city. For instance, Google had 2,000 employees in the city in 2010; it now has more than 12,000. Facebook, Amazon, and Apple together have another 11,000 jobs here—many times their total from a decade ago. As of 2020, Google’s employment in New York resulted in a direct economic impact of \$7.9 billion and an indirect impact of an additional \$5.1 billion, according to an analysis by the Bay Area Council Economic Institute.⁹

Several homegrown companies have become enormously valuable technological heavyweights. As recently as 2017, New York had not launched a single technology company with a stock market capitalization above \$5 billion; now four publicly traded companies have market capitalizations greater than \$8 billion: Datadog, Etsy, MongoDB, and UiPath.¹⁰

Datadog, a Midtown-based enterprise software company created in 2010, may be an unfamiliar name to many New Yorkers, but it now has a market cap of more than \$27 billion, making it the most valuable tech firm based in the city. In May 2022, the company had over 190 job openings listed in New York.

In between tech giants and small start-ups are a vast collection of large and mid-sized startups, many formed in just the past decade, that have each grown to employ hundreds of New Yorkers. The Midtown-based online pharmacy company Capsule, for example, which was founded in 2015 and achieved unicorn status in 2021, employs about 1,000 people in New York, according to founder Eric Kinariwala. Justworks, a Lower Manhattan-based payroll and employee-benefit software start-up founded in 2012, has nearly 800 employees, all but a handful based in New York. Unqork, which makes no-code app-development software used by Goldman Sachs and city government, was formed only in 2017, and now employs around 320 people locally.

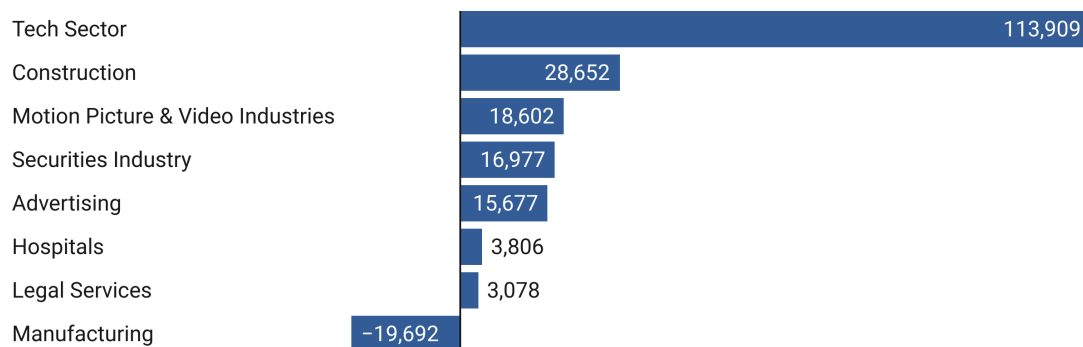
In a sign of the growing maturity of New York’s tech ecosystem, many of those companies’ founders have their roots in other New York-based firms. For example, former employees of the company Gilt Groupe, an online shopping website launched in 2007, have now gone on to form nearly 60 new companies, estimates Wendy Tsu, a partner at the New York venture capital firm AlleyCorp.

There’s also been a striking diversification in the types of firms starting and growing in New York City. As recently as ten years ago, says Jesse Beyrouthey, general partner at the venture capital firm IA Ventures, “The stereotype would’ve been that New York companies were very commercial, and weren’t ambitious enough. A lot of them were in advertising or ecommerce. They weren’t in ‘mainline tech.’ You couldn’t build a top software-based company here, as an example.”

That perception has completely changed. New York remains a leader or major player in many fields where the city has been historically strong, like digital media and ad-tech. But the city has come into its own in a wide variety of other fields, too. “It’s not just a one- or two-category tech thing anymore,” says Tasso Argyros, founder and CEO of ActionIQ. “I think it’s an all-tech thing. And I think as time goes by, and as alumni of companies graduate to start their own companies, it’ll get even more diverse.”

For example, the city is now home to 939 real estate-focused tech start-ups, 872 fintech (or financial technology) start-ups, 752 start-ups working on artificial intelligence (AI), and 220 cybersecurity start-ups. There are also hundreds more start-ups working in travel (453), big data (433), wellness (425), fitness (385), blockchain (276), edtech (211), energy (176),

Tech Sector Creating More High- and Middle-Wage Jobs Than Any Other Sector, 2010–2021



Source: Center for an Urban Future analysis of Quarterly Census of Employment and Wages data for 2010 through December 2021.

pharmaceuticals (167), hardware (167), virtual reality (143), and women-focused products and services (123).¹¹

The city's tech ecosystem has also expanded in other important ways. For example, by June 2021, the number of initial public offerings (IPOs) for New York-based tech companies for the year had reached 12, already exceeded the total for the previous four years combined, according to data from EY.¹² By the end of the year, the number reached 30, including marketing data firm Braze, website builder Squarespace, restaurant software platform Olo, and cloud infrastructure provider DigitalOcean.

The number of New York-based tech investors—including venture capital firms—has also exploded in the past decade, going from 621 VC firms and investors in 2020 to 1,790 today.¹³

“When we tried to raise money for our last start-up in early 2009, I don't think we even talked to a VC firm in New York,” says Justworks founder Isaac Oates. “At the time, the way that you raised money for your company was that you flew to San Francisco, rented a car, and drove up and down Sand Hill Road [in Silicon Valley] to nondescript office parks to pitch VCs. I think that script has totally flipped.”

All of this has led to previously unfathomable increases in capital availability for New York-based tech companies. In 2020, despite the pandemic, venture capital investments in New York tech firms totaled a whopping \$55 billion, the largest one-year total to date, according to CUF's analysis of data from CB Insights. That's up from just \$11.2 billion in 2015—a 132 percent increase—and cementing New York's

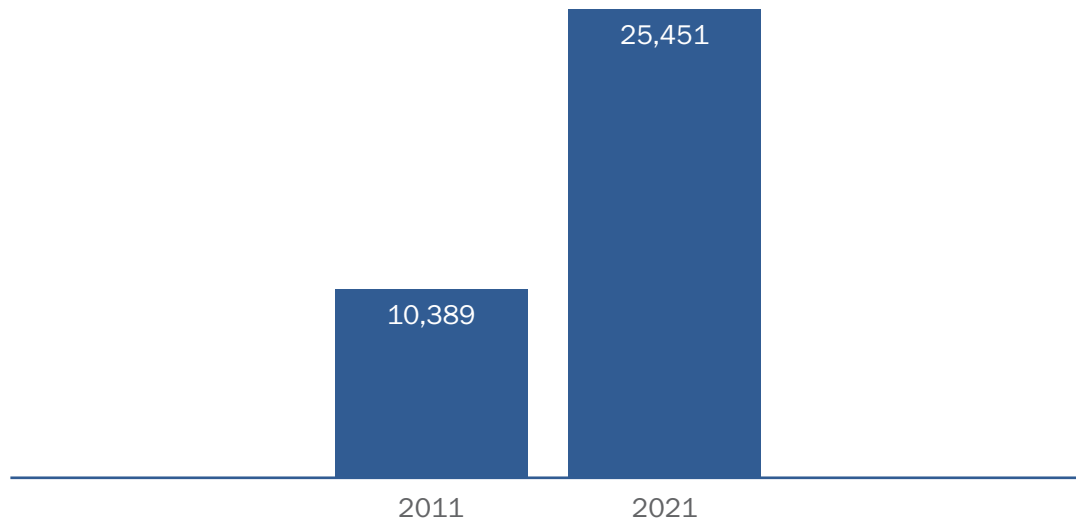
position as second in VC funding only to the San Francisco Bay Area. New York also experienced the largest increase in venture capital investment of any U.S. metro area between 2012 and 2021.¹⁴

A Competitive Advantage for New York

The most successful urban economies are typically those that succeed in building a competitive advantage in one or more high-wage industries. New York previously did this in the securities industry (17 percent of the nation's securities jobs are still located in New York City) and several creative sectors (15 percent of the nation's film/TV jobs are here, as are 12 percent of advertising positions). Over the past decade, New York has begun to establish a major competitive advantage in tech, too, by nurturing a self-sustaining and increasingly diversified ecosystem replete with funders, founders and highly skilled employees—resulting in a large and growing share of the nation's tech jobs.

New York City now accounts for 15.6 percent of all jobs nationally in Internet-related tech companies, nearly double its share from a decade ago (8.9 percent).¹⁵ New York also has an increasingly large share of overall U.S. tech sector employment, comprising 3.1 percent of the nation's jobs in the sector, up from 1.7 percent fifteen years ago.

Number of NYC Tech-Enabled Start-Ups, 2011 vs 2021



Source: Center for an Urban Future analysis of data from Crunchbase
Created with Datawrapper

NYC Tech Sector Employment Growth By Subsector, 2011 to 2021

Industry	2011	2021
Computer Manufacturing	2,867	2,951
Electronic Shopping and Mail-order Houses	7,720	15,559
Software Publishers	1,560	24,328
Data Processing, Hosting and Related Services	4,902	10,833
Internet Publishing & Web Search Portals	9,367	51,619
Computer Systems Design	47,898	70,736
Scientific Research and Development	13,544	17,903
Tech Sector, Total	87,858	193,929

Source: Center for an Urban Future analysis of Quarterly Census of Employment and Wages data for 2011 through December 2021.

Created with Datawrapper

New York City also has more tech-enabled startups (25,451) than any place other than the San Francisco Bay Area (which has 31,194). In fact, New York has more start-ups than the city of San Francisco (which has 15,303) and nearly double that of Los Angeles (14,959). New York also has more start-ups than Boston (7,623), Miami (6,807), Austin (5,355), and Seattle (5,011) combined.

Reflecting these numbers, the New York metro region also received 15.9 percent of the nation's venture capital investment in 2021, well ahead of every other region except the Bay Area, including Boston (which received 10.6 percent of VC dollars), San Jose (8.0 percent), Los Angeles (7.2 percent), San Diego (2.9 percent), Seattle (2.4 percent), Austin (1.5 percent), and Miami (1.4 percent).¹⁶

According to our analysis, New York was the only city in the nation besides San Francisco to add more than 100,000 tech sector jobs during the past decade—and New York's employment growth rate outpaced that of every major city except San Francisco, Seattle, and Philadelphia.

Emerging Sub-Industries & Other Areas to Build On

New York's success in developing a leading presence in several emerging tech sub-sectors suggests that the city's tech sector is poised for even more job growth in the years ahead.

New York has seen the number of blockchain and cryptocurrency start-ups more than triple since 2016, growing from 110 to 338—a 207 percent increase. New York posted start-up growth of more than 50 percent in ten different subindustries since 2016, including wellness companies (+107 percent), artificial intelligence (+85 percent), +retail technology (+69 percent), and augmented reality (+54 percent). Other notable subindustries experiencing strong growth include start-ups focused on providing products and services to women (123 firms, up from 83 five years ago); e-learning companies (176 start-ups, up from 120); and fintech (872, up from 576).

Facing New Headwinds

None of the founders, investors, technologists, and experts we interviewed for this report were pessimistic about the future of New York City's tech sector. Indeed, most were downright bullish. But there is evidence that New York is facing new challenges that emerged during the pandemic which have the potential to grow into serious threats in the years ahead.

Chief among them is the rise of remote work, a trend that could begin to negate one of New York's biggest advantages: its unmatched ability to attract talented workers and entrepreneurs. Indeed, over the past fifteen years, countless tech companies opted to start or relocate in New York despite the city's sky-high costs—including office rents and taxes—because no other place gave them access to as large a pool of talent. But remote work has the potential to change this equation. It could induce some companies to move to less expensive locales, knowing that they can still hire employees that live in New York, or prompt engineers and other in-demand tech workers that are currently based here to move to cities with more affordable housing, shorter commutes, and higher quality of life—a development that could in turn convince additional tech companies to relocate. It's also possible that tech companies will remain in New York but hire significantly fewer employees who live here.

In a 2021 survey, San Francisco-based VC fund Initialized found that 42 percent of its firms' founders said that if they were starting a business today, the best place to locate it would be in the cloud, or as a decentralized company with remote workers in various locations.¹⁷ The founders we interviewed for this report generally told us that tech's rapid embrace of remote work is here to stay, and that a growing willingness among employers to open up positions to remote candidates is helping start-ups find the talent they need to drive future growth. A May 2022 survey by Accenture Research and Tech:NYC found that 80 percent of the tech companies surveyed experienced employee resistance to returning to on-site work.¹⁸

Compounding the problem, just at the time when companies and workers are more mobile than ever, cities such as Miami, Austin, Nashville, and Los Angeles are making a convincing play for New York-based firms and talent.

Most visibly, Miami has been attracting an increasing number of fintech and blockchain companies—as well as a bevy of tech workers previously based in New York—because of its crypto-friendly mayor, its connections with Latin American markets, and its relatively high quality of life. (A recent executive order signed by California Governor Gavin Newsom creates a new regulatory approach to blockchain technology and could add further pressure on New York's nascent ecosystem.) While it's far from clear that Miami poses a legitimate threat to New York's position in blockchain or other tech sub-industries, a recent [Quartz](#) analysis of LinkedIn data found that Miami saw a 15.4 percent increase in net migration of tech workers between March 2020 and February 2021 compared to the year before. In that same timeframe, there was an 18.2 percent decrease in net migration of tech workers from New York.¹⁹

Amid these shifting winds, several of the tech stakeholders and company founders interviewed for this report say that rising rents and the overall high cost of living in New York is a major concern, one which they fear will make it more difficult for them to attract and retain workers with the necessary skills.

Many of those we interviewed say that finding skilled employees is already their biggest challenge. Claroty, a New York-based cybersecurity firm, has its executive sales and marketing teams mostly based in Manhattan. But its engineering workforce is largely in Israel, where the company has said it has greater access to relevant talent. Likewise, UiPath's leadership is in Manhattan, but the company still has significantly more employees Romania: 727, including most of its software development staff.

"Maintaining a team of developers in New York City is almost impossible now, unless you're someone whose profits are astronomical and you're just going to pay up for talent," says Jonathan Truppman, chief legal officer at consumer-tech company Oddity and former general counsel of Casper.

Finally, a city bureaucracy described as "a slog", according to one startup executive, is strengthening the value proposition presented by other cities and countries, especially when places from Austin to Uruguay are rolling out the red carpet for technologists and innovators. For start-ups that need to secure permits and approvals from city agencies, the challenges are even steeper.

"Some projects are taking over two years to permit, and really there's no end in sight for others," says Emmerick Patterson, head of acquisitions at MicroGrid Networks, a battery storage company. "There needs to be some leadership that helps drive these projects forward."

Keeping NYC's Tech Jobs Pipeline Growing

Despite the incredible gains in the tech sector over the past decade, this report concludes that additional job growth is far from assured and that city leaders will need to play a stepped-up role to ensure that New York's tech sector achieves long-term sustainable growth.

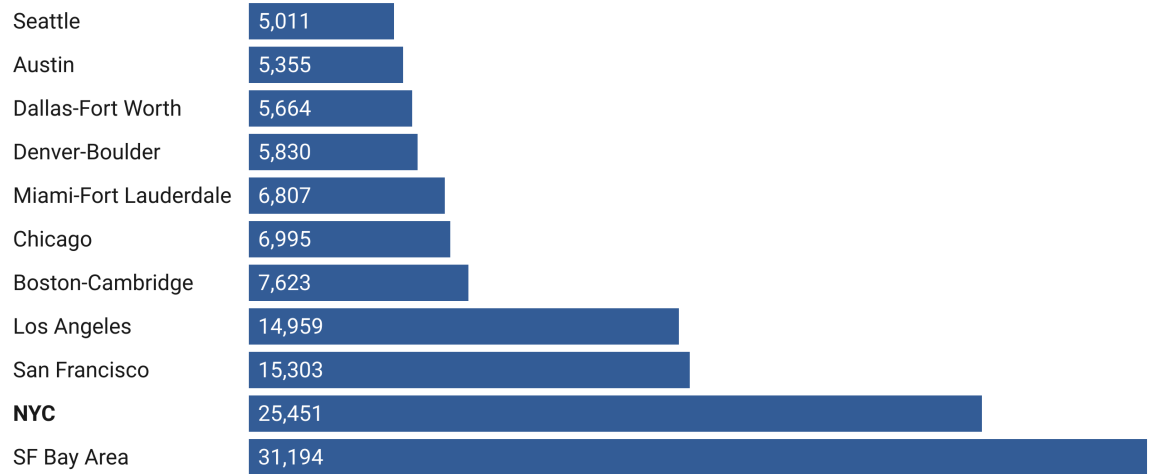
As New York looks to cultivate the next era of tech sector growth, experts we interviewed say that the city would be wise to build on several areas of existing strength—and develop policies to make further progress by leveraging these areas.

Arguably one of the city's greatest advantages compared to other major tech hubs is its diversity. Although the ranks of company founders and VC partners alike remain overwhelmingly white and male, the past decade has brought change to the sector, and these trends could accelerate in the years ahead with a new level of attention and investment from government and industry leaders.

Today, New York is home to more than 120 start-ups focused on providing products and services to women, most of which are run by women founders. These include Maven Clinic, a woman-led telehealth company that this year [became the first and so far only U.S. unicorn](#) dedicated to women's and family health, and Alloy, a start-up that provides medical guidance and treatment options for women experiencing menopause.

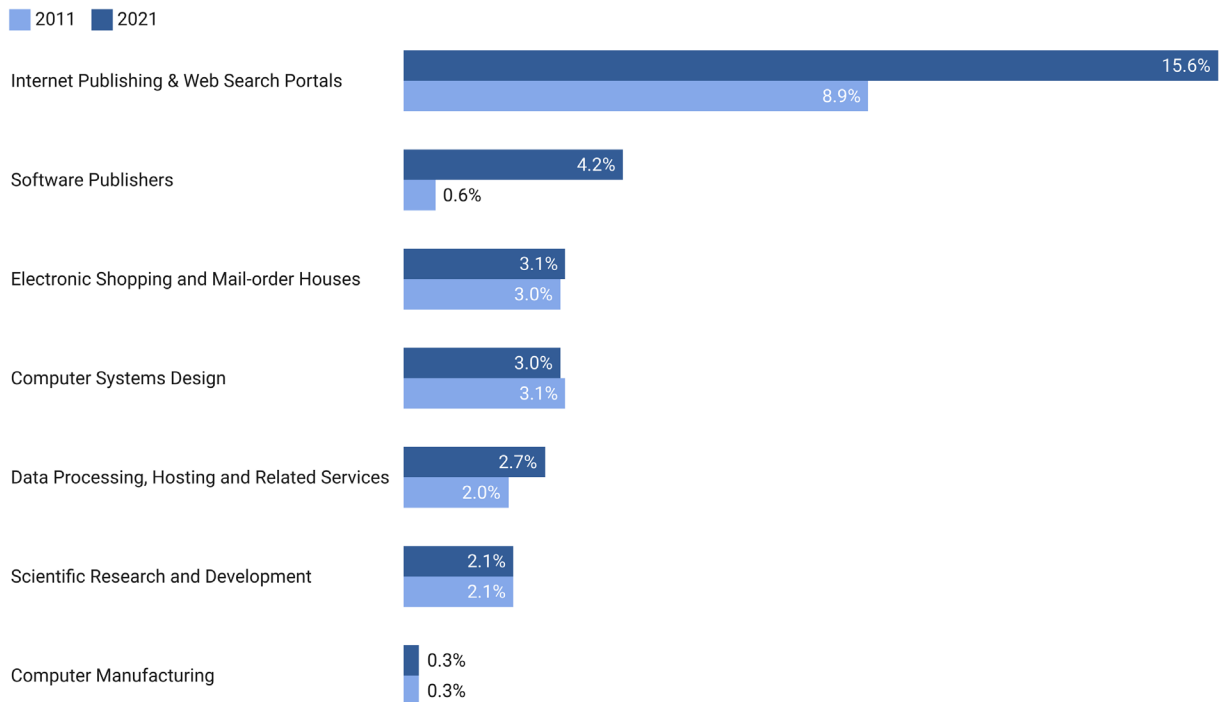
New York also benefits from a more diverse tech sector workforce than that of other major tech hubs, although major disparities remain. There are more Black workers employed in the seven core industries that make up the tech sector in NYC (17,874) than in the tech sectors of San Francisco, Boston/Cambridge, Seattle, and Los Angeles combined (13,588). Still, New York has a long way to go to achieve equity in tech sector employment. Black and Hispanic workers make up 43 percent of New York City's overall workforce, but hold just one-in-five tech sector jobs. Overall, men

Number of Start-Ups by City, 2021



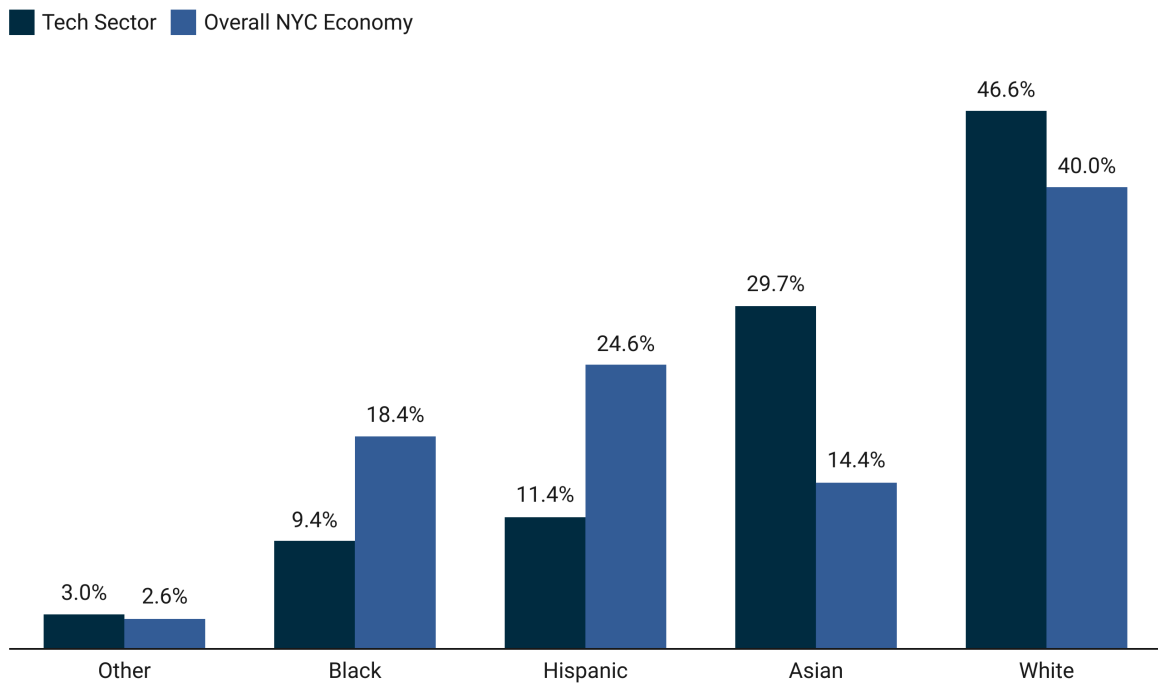
Source: Center for an Urban Future analysis of data from Crunchbase
Created with Datawrapper

NYC's Share of National Tech Sector Employment by Subindustry, 2011-2021



Source: Center for an Urban Future analysis of Quarterly Census of Employment and Wages data for 2011 through December 2021.
Created with Datawrapper

Race & Ethnicity of NYC Tech Sector Workforce



Source: Center for an Urban Future analysis of data from the 2019 American Community Survey 5-Year-Estimates
Created with Datawrapper

hold three quarters (76 percent) of the city’s tech jobs, while women hold less than one quarter (24 percent).²⁰

When it comes to another source of the city’s economic competitiveness—its embrace of immigration and globalization—experts see more room to grow. New York already serves as an entry point for foreign companies looking to plant a beachhead in the United States, and has developed initiatives like the In2NYC program to attract foreign entrepreneurs. But when it comes to attracting foreign investment and entrepreneurship, New York has room for improvement compared to peer cities. Over the past decade, New York finished a distant second to London for total inbound foreign direct investment from VC-backed firms, with 240 greenfield projects in London, compared to 115 in New York. New York closed out the decade with just 5.7 greenfield projects per one million residents—a significantly smaller share than London, Singapore, San Francisco, Berlin, Sydney, or Boston.²¹

Likewise, there’s little doubt that New York’s academic institutions have made a substantial effort to

grow their involvement in supporting tech innovations over the past decade. All of the more than one dozen accelerators in Columbia University’s Lab-to-Market (L2M) Accelerator Network were created in the last 12 years. NYU Tandon created four “Future Labs” spread across Brooklyn in the wake of the 2008 financial crisis. Cornell Tech’s Runway Startup Postdoc Program teaches recent PhDs in digital technology fields to shift from an academic to an entrepreneurial outlook. And CUNY is home to multiple accelerator programs, including CUNY Startups’ New Venture Accelerator and Queens College Tech Incubator.

But with additional strategic support, those academic institutions could play an even more central role. PitchBook’s latest rankings of undergraduate and MBA programs by the number of VC-backed founders among their alumni, for example, put Columbia University at 15th and NYU at 21st, far behind schools in California and Boston. SUNY is ranked 49th; CUNY did not make the list.²²

Emerging Areas of Growth in NYC's Tech Ecosystem

Women's and family tech

Though women remain underrepresented as founders and workers in New York's tech sector, the city is home to a fast-growing number of companies that are both marketed toward and led by women. In addition to Maven Clinic and Alloy, mentioned earlier, New York is home to more than 100 other start-ups focused on providing products and services to women, including Ellevest, a virtual financial planning service, created in 2014 by former Wall Street CEO Sallie Krawcheck to help women invest and manage money, which now has more than \$1.44 billion in funds under management and raised a \$53 million series B funding round in April 2022. There's also theSkimm, a digital media company serving millennial women that was founded in 2012 by Carly Zakin and Danielle Weisberg and boasts over seven million newsletter subscribers.

Many of the most exciting firms in this category have created technology-enabled services that address women's health and wellness, like Aavia, which developed an app for managing birth control; Dame Products, a women-founded sex toy startup; Oova, a midtown company that offers an at-home product that helps women track fertility hormone levels; and Seven Starling, which offers virtual platform to support families through pregnancy.

"New York has an opportunity to become the global leader in women-led tech promoting sexual health and wellness," says Cindy Gallop, the founder of MakeLoveNotPorn, a New York-based, sex-positive video-sharing platform. "New York City is home to arguably the world's largest community of women-led sex tech companies, part of an industry projected to be worth \$122 billion by 2024. Fem tech, an industry focused on tech that addresses women's health issues, is expected to be a \$3 billion industry by 2030."

Of course, New York women have founded companies across every portion of the sector; start-ups founded by women in the New York metro area [raised \\$6.7 billion](#) between January and September 2021, according to Pitchbook data, blowing past

the \$3.2 billion they raised in all of 2020. VC firms focused on supporting companies led by women, like the Females Founders Fund and BBG Ventures, have also found a home in New York.

Blockchain

Despite a strict regulatory framework governing virtual currency at the state level, New York City has emerged as a major hub for cryptocurrency and blockchain companies, along with those focused on the related fields of decentralized finance and Web3. CUF's analysis found that the cryptocurrency and blockchain subsector was among the fastest growing in the city, jumping from 110 startups in 2016 to 338 last year, a growth rate of nearly 208 percent. By the first month of 2022, cryptocurrency startups also [dominated the list](#) of the most valuable startups in the city, and many are continuing to grow their presence here, like the blockchain security company Chainalysis, which last August [leased a 40,000-square-foot Flatiron office](#) with space for 400 employees and recently closed a \$170 million series F funding round, which valued the company at \$8.6 billion.

Other notable companies include OpenSea, a marketplace for nonfungible tokens (NFTs), which [raised \\$300 million](#) from investors in January; the [cryptocurrency exchange](#) Gemini; Brooklyn-based Consensus; Uniswap Labs in SoHo; and Paxos in Midtown. When the Silicon Valley investment firm Andreessen Horowitz announced [in a statement](#) the hiring of its first general partner in New York last year, it says its leadership was "incredibly bullish on this particular region and talent pool as the epicenter of crypto and fintech innovation."

The city also plays host to several smaller firms, including those based far from Manhattan's traditional business districts. Voice, an NFT platform for artists founded in 2019, for example, has based itself in Bushwick, where it has easy access to the two industries that define its work.

20 Tech Sub-Industries With Fastest Growth in Number of Startups Over Last 5 Years

Field	2016	2021	Growth (#)	Growth (%)
Cryptocurrency	45	159	114	253.3%
Blockchain	87	276	189	217.2%
Wellness	205	425	220	107.3%
Personal Health	89	166	77	86.5%
Artificial Intelligence	407	752	345	84.8%
Machine Learning	291	502	211	72.5%
Retail Technology	94	159	65	69.1%
FinTech	526	872	346	65.8%
Consumer Goods	207	335	128	61.8%
Augmented Reality	68	105	37	54.4%
Women's	83	123	40	48.2%
E-Learning	120	176	56	46.7%
Beauty	179	262	83	46.4%
Biotechnology	247	359	112	45.3%
SaaS	567	824	257	45.3%
Fitness	265	385	120	45.3%
Predictive Analytics	87	126	39	44.8%
Food and Beverage	431	619	188	43.6%
Consumer	117	167	50	42.7%
Medical Device	89	127	38	42.7%

Source: Center for an Urban Future analysis of data from Crunchbase

Created with Datawrapper

“A lot of our events that we run in the local neighborhood are often really well attended, because there are so many people that are interested in blockchain and NFTs that just live in Bushwick,” CEO Salah Zalatimo says. “So even though it’s not the most centrally located, it still has a critical mass of artists and blockchain advocates and so it really worked out well for us.”

These blockchain companies have joined an already thriving fintech industry in New York that is increasingly intertwined with the city’s traditional banking firms. Major San Francisco-based fintech

companies like Stripe, Plaid Technologies, Affirm, and Brex have [all opened offices in New York in recent years](#), but there have been no shortage of homegrown success stories, including the SoHo-based online insurance company Lemonade, which was founded in 2015 and had [the most successful IPO](#) of any New York company in 2020. And the sector shows no signs of slowing down: there are now at least 3,975 start-ups focused on some aspect of financial services across the five boroughs, accounting for nearly 16 percent of the city’s total start-up scene.

Augmented/Virtual Reality and the Metaverse

Interest in the metaverse isn't limited to Silicon Valley giants like Facebook (now known, not coincidentally, as Meta); the number of virtual and augmented reality firms in New York is growing, increasing from 137 in 2016 to 197 last year, a 44 percent growth rate.

Those newcomers include the NoHo-based Spatial, a company founded in 2016 that creates virtual collaboration spaces and which *Fast Company* named of the 10 most innovative AR/VR companies in 2021. There's also Obsess, which offers augmented and virtual reality shopping experiences for retailers, and was founded by Google alum Neha Singh in 2017 at a Techstars coworking space in New York. Since then, the company has partnered with high-profile brands like Ralph Lauren and Fendi, and in July 2021 it secured \$10 million in Series A funding. Even newer is Hudson Square-based Echo3D, which helps developers and content creators build VR and AR apps. The company was founded in 2018; by October 2021, it had over 11,000 registered users and secured \$4 million in funding.

While the pandemic has driven interest in opportunities for virtual connection, interest in virtual and augmented reality is, of course, older than the novel coronavirus, especially among media-focused industries. A 2018 analysis by Indeed of job listings in the gaming industry, for example, found New York had the highest number of postings requiring VR and AR skills of anywhere in the United States, and the city is home to important legacy companies in that field, such as Take-Two Interactive and its subsidiary Rockstar Games. And as the center of the country's media ecosystem, New York is well-positioned to play host to the VR and AR sector as it grows and matures.

"The metaverse is mostly media," says Danny Crichton, head of editorial at the VC firm Lux Capital. "Obviously New York is a major media capital, and there's a lot of infrastructure here to make that happen."

E-Learning / Education technology

New York City has the largest public school system in the country and a major cluster of universities and colleges, so perhaps it's no surprise that the city is home to more than a thousand tech companies

focused on education, too. There are 1,370 education-focused tech companies in the city, CUF's analysis found. Another sign of burgeoning interest is the NYEdTech group on Meetup, which includes over 9,000 members. Perhaps driven by the pandemic, e-learning companies were among the fastest growing subsets of the tech sector, jumping from 120 New York-based companies in 2016 to 176 last year, a growth rate of 47 percent. Nationally, investment in edtech increased during the pandemic, according to data from PitchBook; start-ups in the sector raised \$1.78 billion in venture capital during 2020, compared to \$1.32 billion the year before.

"COVID has amplified and accelerated behavioral change that was already happening in an education system ripe for change, largely around showing that there is a much wider variety of ways to learn effectively," Rebecca Kaden, managing partner at Union Square Ventures, which has invested in several edtech companies, told TechCrunch last year. "I don't at all believe in-person learning is going away—but I think it is much more likely we see hybrid models emerge where there are places for tools that allow flexibility, personalization and interest-led learning to integrate into education."

New York's edtech sector now includes at least two unicorns: Articulate and Newsela. Articulate, a software-as-a-service (SaaS) platform that companies use to create training courses for employees, raised one of the biggest series A rounds ever in 2021 (\$1.5 billion), bringing its valuation to \$3.75 billion. Newsela, another New York startup that provides a SaaS platform for K-12 instructional material, achieved unicorn status in February 2021.

Edtech firms have taken a variety of forms. Some of the most well-known companies in the space are focused on training people to enter the tech industry itself through coding bootcamps and accelerated learning programs, like Codecademy, headquartered in Manhattan, and the Queens-based Pursuit. Others offer platforms for educators to design and sell courses, like the midtown-based Teachable, which was founded in 2013 and sold to a Dutch company in 2020; the firm says it generated \$250 million for the 20,000 instructors who use the platform in 2019 alone. Still others offer tools to supplement teachers' curricula, like Zearn, a nonprofit content publisher and software developer focused on math education. The midtown-based organization, which was created in 2012,

estimates 1 in 4 elementary students nationwide have used its platform, and has used its data to highlight inequities in schools.

Even older firms are finding new life in this expanded ecosystem; after nearly 20 years in business, Articulate, an online course creation platform founded in the city in 2002, announced last year a massive \$1.5 billion funding round on a \$3.75 billion valuation.

Artificial intelligence / Machine learning

New York is now a major hub for artificial intelligence and machine learning, technologies that have become increasingly vital across a variety of industries. The number of AI and machine learning-focused companies in the city jumped from 566 in 2016 to 973 last year, a 72 percent increase, according to CUF's analysis of Crunchbase data.

Over \$9 billion in funding has been invested in New York AI companies, and 13 percent of the country's AI workforce is located here, according to Georgetown University's Center for Security and Emerging Technology.²³ While the San Francisco area still hosts the largest portion of the AI workforce, the 2020 study found, it had the lowest rate of growth of AI employees at 18 percent. East Coast hubs, meanwhile, grew between 30 percent and 57 percent. And expertise in AI was the third most in-demand skill for New York employers last year, according to a survey of tech CEOs conducted by Tech:NYC and Accenture, following cybersecurity and cloud talent.²⁴

Companies in this sector are using the technology for a wide variety of applications. Ocrolos, a Manhattan-based company founded in 2014, launched with the intent to use AI to automate parts of the Medicaid application process before expanding to analyze and process all types of financial documents. The company's revenue grew from \$1 million in the first quarter of 2018 to \$20 million in the second quarter of 2021, and it [raised \\$80 million](#) in Series C funding in September 2021. The enterprise data automation platform Hyperscience, also launched in 2014, says it has doubled its employee count during the pandemic, and in June 2021 [signed a 10-year lease](#) for the entire 88th floor of 1 World Trade Center. Smaller firms are growing too, like midtown-based Actuate, which uses AI software to operate security camera systems and [closed a series A financing](#) of \$8 million in April 2021.

Cybersecurity

In recent years, cybersecurity has become a primary concern across nearly every major industry and within government. Companies and municipalities are making use of increasingly powerful digital tools to automate processes, control vital infrastructure, conduct financial transactions, and store sensitive data, while incidents of cybercrime have spiked an alarming 81 percent since 2019, according to the latest data from the Federal Bureau of Investigation. The pandemic-driven shift to remote work has raised further concerns about virtual vulnerability, as have recent high-profile cyberattacks conducted as part of Russia's invasion of Ukraine. In response to these growing challenges, Mayor Adams and Governor Kathy Hochul have made cybersecurity a focus of their administrations; in February 2022, they partnered with other local leaders to launch a Brooklyn-based Joint Security Operations Center intended to bolster New York State's ability to detect and respond to cybersecurity threats.

"We're moving into an increasingly digital world, so there are a lot of companies that are really focused on cybersecurity solutions to protect other companies," says Reza Chowdhury, founder and CEO of the tech news site AlleyWatch.

That's all been a boon for the city's cybersecurity firms, particularly since many of the hyper-valuable companies needing protection are also headquartered in New York. Over the past five years, the number of cyber security companies in the five boroughs increased by 36 percent, from 162 in 2016 to 220 in 2021.

Two New York-based startups, [Deep Instinct](#) and [Security Scorecard](#), secured investment rounds of at least \$100 million last year. Other notable companies with headquarters in New York include Claroty, Socure, and Panorays, all of which were formed in the last decade.

A May 2022 survey by Accenture Research and Tech:NYC found that cybersecurity was the top area of expertise that New York employers are looking to hire in, with 64 percent of New York-based tech employers saying they are seeking employees with this expertise. Average cybersecurity salaries in New York climbed to \$149,000 in 2020, from \$136,000 the year before, according to a survey from the job sites Hired and Vetterly.

Real Estate

New York's status as a center of commercial and residential real estate has made it a natural home for real estate tech and property tech (proptech). The number of real estate-focused startups in the city grew from 1,225 in 2016 to 1,572 last year, CUF's analysis found, a growth rate of 28 percent. The sector now accounts for over 6 percent of all start-ups citywide.

As with fintech, the proptech subsector includes companies that have moved to New York from elsewhere in the United States—like Hightower from Seattle, SquareFoot from Texas, and Kwant.ai and Okapi from the Bay Area—and from abroad, especially from Israel. But there are plenty of locally-grown companies with impressive track records, too. Latch, a Manhattan startup which makes phone-activated locks, was [acquired and taken public](#) by Tishman Speyer in a \$1 billion deal in 2021. Other notable firms include Reonomy, an eight-year-old real estate data startup in midtown that was purchased for just under \$200 million last fall; the digital title insurance startup Spruce, which was founded in Manhattan in 2016 and raised \$60 million in a series C funding last June; and Compstak, the crowdsourced commercial real estate data company based in Cooper Square, which now has about 100 employees and raised \$50 million in series C funding last fall.

While the pandemic era and the rise of remote or hybrid work has thrown many major real estate firms for a loop, it's also created opportunities for innovation among proptech firms. Building requirements imposed by the city's Local Law 97 are also driving the creation and growth of proptech startups seeking to get properties up to code.

"Companies in our portfolio that are leveraging data and centers and analytics and space planning to help people manage their new hybrid paradigms, those companies are thriving," says Zach Aarons, a co-founder of the proptech-focused VC firm Metaprop.

The growth of Metaprop itself is another sign of the sector's evolution. The firm was founded in 2015 with \$5 million in funding. By 2018, the firm raised \$40 million for its second fund. In June 2021, Metaprop closed a third fund of \$100 million to invest in early-stage companies. They're [also looking to raise an additional \\$200 million](#) to back later-stage startups, in what would be the firm's biggest fund yet.

Direct-to-consumer and e-commerce companies

In earlier eras, New York's tech scene was largely defined by consumer-facing companies. Even as the sector has diversified in recent years, these direct-to-consumer firms remain a core part of the city's ecosystem. CUF's analysis of Crunchbase data found that the number of commerce and shopping startups in New York City jumped from 2,856 in 2016 to 3,618 in 2021, a number that constitutes over 14 percent of the city's total start-ups.

"It's all the companies that advertise in the subways," says Julie Samuels, former executive director of Tech:NYC. "This is the next generation of companies that are growing really rapidly."

This sector encompasses a very broad range of products and offerings, but several notable companies stand out. The online eyeglass retailer Warby Parker, which was [born in a Philadelphia bar](#) in 2010 but has been headquartered in Manhattan for most of its history, is an anchor of the sector. Warby Parker went public in 2021 [as a certified B Corp](#), a designation that requires it to consider social and environmental priorities in equal measure to shareholder value. Other homegrown firms include e-commerce beauty and apparel companies like Dumbo-based Rent the Runway and the Manhattan-headquartered Glossier, the mattress company Casper, and the digital wedding registry Zola.

Other recent entrants to the sector include the small-batch meal delivery startup CookUnity, which was launched in 2015 with a flagship kitchen in Brooklyn and [raised \\$47 million](#) in a series B funding round last year; and Brooklinen, a Brooklyn-based startup [run by a husband-and-wife team](#) that sells bedding and other home goods online. The company now has two brick-and-mortar retail spaces in the city and in February 2022 had [over 20 job listings posted](#) for its New York office.

Business-to-business and enterprise services

In recent years, the city's tech ecosystem has expanded to include many more types of companies. For one, a wide selection of B2B-focused tech firms has launched and found a new level of success.

How Policymakers Have Shaped the City's Tech Sector

New York's exponential growth in the tech sector has largely been an organic process, aided more by the city's overall attractiveness and strength in legacy industries than any specific city government policy action. But over the past two decades, city leaders have taken several important steps that undoubtedly contributed to the sector's rise in New York.

In the late oughts, when the city's tech renaissance was still in its early days and the tech sector was still very much in the shadow of traditional economic engines like finance, Mayor Michael Bloomberg provided an important psychological boost simply by publicly embracing the emerging sector. He held press conferences at the offices of small start-ups, touted New York's growing in tech on many occasions, and gave the impression that New York City was all-in on this still-small but fast-growing part of the economy. For example, when OnDeck was opening a new office in the city during the Bloomberg years, the company contacted the mayor's office. "We asked if the mayor would be interested in doing a little ribbon cutting and presentation at the office to our employees," says Noah Breslow, then OnDeck's CEO. "And amazingly, the answer came back in 48 hours and it was yes. It turned into a great press event that our employees will never forget, and I'll never forget. And it just showed that the tech sector matters."

During the Bloomberg administration, the city's Economic Development Corporation (NYCEDC) also launched more than a dozen initiatives designed to support the sector's growth—from new incubator and accelerator programs to venture funds. Notably, his administration's ambitious Applied Sciences NYC initiative led to the creation of the Cornell Tech campus, the NYU Center for Urban Science and Progress, and Columbia's Data Sciences Institute. "That was the thing that really put New York City on the map," says Emil Skandul, a writer and head of the creative tech firm Capital Foundry. "The success of Applied Sciences NYC was such good marketing for New York."

Many of the industry leaders we interviewed say that Mayor Bill de Blasio was less visible in championing the tech sector. However, the de Blasio administration took important steps to prepare New Yorkers from low-income backgrounds for tech careers, launching initiatives such as the Tech Talent Pipeline to the Cyber NYC initiative, which among other things involved the creation of a cybersecurity master's degree at CUNY's City College

In his first five months in City Hall, Mayor Eric Adams has shown a promising willingness to embrace both approaches: serving as a cheerleader for New York's tech sector and unveiling new initiatives to expand access to the industry's well-paying jobs. For example, early on in his administration, Mayor Adams announced with much fanfare that he would take his first three paychecks in bitcoin, signaling his intention to make New York a global hub for the cryptocurrency. He has publicly championed the tech sector in speeches and at events, and in May launched a new initiative designed to help transform New York into a global hub for the digital games industry.

Mayor Adams has also made it clear that diversifying the sector's workforce is a major priority. The mayor's blueprint for the city's economic recovery—Rebuild, Renew, Reinvent—included several new initiatives designed to expand opportunities for New Yorkers to access tech careers.

"The biggest imperative for the administration as it relates to the tech sector is talent—specifically, partnering with industry to meet growing workforce needs with local, diverse talent," reads one section of the mayor's blueprint. "As it stands, the tech workforce does not reflect the diversity of our city, particularly in management ranks and in its investor and entrepreneurial communities. We will work with industry on holistic strategies to develop a robust, local K-16 and adult workforce tech talent pipeline that meets industry needs."

Datadog and MongoDB, mentioned earlier in this report, are just two examples. The company Olo, which offers a back-end system for restaurant orders to clients like Shake Shack, Five Guys and Denny's, employs over [430 people](#) and went public in 2021 with a valuation of [\\$3.6 billion](#). Cockroach Labs, a business database provider founded in Manhattan in 2015 by three ex-Google staffers, has nearly 130 New York employees and was ranked [the third best company](#) in the city to work for in 2021 by Crain's (35 of the 100 firms on the list were categorized as "technology" companies). Manhattan-based Electric, which was founded in 2016 and provides IT services to small businesses and [employs about 400 people](#), nearly all of them in New York. Braze, which helps companies organize communications for customers across online channels, has [about 360 local employees](#).

"These enterprise companies are really growing leaps and bounds," says Chowdhury. "These solutions are helping other companies do their job better, so there's a natural fit with New York. They're not necessarily the sexiest thing you read about, but they're really solving a problem for companies, which are willing to pay for it because it ends up affecting their bottom line."

Consumer health

New York has long been a major hub for healthtech, thanks in part to the presence of numerous hospitals and other medical research institutions. But a new wave of companies focused on wellness and mental health, as well as those offering virtual care, are also starting to make their mark. CUF analysis finds the number of healthcare startups in the city grew from

1,667 in 2016 to 2,409 in 2021, a growth rate of 44.5 percent. These startups now constitute 9.5 percent of all startups in the city.

Besides online pharmacy Capsule, mentioned earlier in this report, the growing nexus of healthcare businesses include the Soho-based ZocDoc, an online booking platform for doctors that serves about [six million people](#) per month. Although ZocDoc helped patients book [millions of telehealth](#) appointments during the pandemic, it has made clear its dedication to keeping its own staffing work in-person, at least [some of the time](#), and 61 of the 71 job openings [listed on its site](#) in December 2021 were in New York.

The Flatiron telehealth company Ro [has at least 250 employees](#) in New York and is among the most valuable private healthcare start-ups in the city, despite having been formed in just 2017. Medly, a Brooklyn-based pharmacy startup, moved into [a 30,000-square-foot Bushwick office space](#) in 2020, shortly after raising \$100 million. Maven Clinic, a woman-led telehealth company, last year [became the first and so far only U.S. unicorn](#) dedicated to women's and family health. Among those leading in the mental health space is the Gramercy-based Spring Health, an online benefits platform founded in 2016 that now has a valuation of [\\$2 billion](#). The company's 29-year-old co-founder and CEO, April Koh, is the youngest woman to run a unicorn.

Healthtech companies are also raising more money than ever before. An analysis of 182 companies by [New York City Health Business Leaders](#) found the companies collectively raised \$9 billion, shattering the record set the previous year by 150 percent. About 36 percent of that funding went to startups focused on virtual care, 13 percent to those focused on biotech, and 9 percent to mental health companies.

No Time to Rest: Rising Competition and New Headwinds Present Policymakers With Challenges

While founders, investors, and other industry stakeholders are bullish on the future of New York's tech economy, it is by no means a given that the tech sector will continue to add jobs here at anything close to the rate of the past decade. The recent departure of some tech companies and workers from San Francisco should serve as a warning sign that technology jobs are not permanently tied to one place. As described across dozens of interviews with New York-based tech stakeholders, policymakers will need to address several important challenges and risks in the months and years ahead.

The rise of remote work could reshape the city's economy

The growing acceptance of remote and hybrid work has undoubtedly been a boon for tech companies. The ability to hire anywhere has expanded access to new pools of talent across the country and globe, and has given companies financial and logistical flexibility while reducing some costs. In the short term, remote work does not seem to have dimmed the desire of most tech workers to live in New York. But the flexibility provided by remote work could prove to be a challenge for the city itself, if employers find it easier to hire talent quickly and affordably in other places, even if the firms remain headquartered here.

"You talk to recruiters, they'll tell you you can find someone faster if it's remote than to find someone specifically in New York," says Argyros of ActionIQ. "And when you look for remote, you find some people in New York, but it's a different environment. It's a remote company, so you don't have as much of a need for headquarters or people commuting. And that creates an impact, in the indirect benefits that they can have on the city."

Tech is arguably the city's fastest-recovering industry, but it has also been among the slowest to return to the physical office. A survey published in May

2022 by the Partnership for New York City found that average daily office attendance for companies in the tech industry at the end of April was just 44 percent.²⁵ Even as many companies boast high employee counts in New York, it's not always obvious where, in fact, those employees actually are. Meanwhile, many of the city's fastest-growing startups are opening their job postings to people who live outside of commuting distance, even if they remain rooted in New York.

To be sure, major New York tech companies like Google—which is investing \$2.3 billion to expand their real estate footprint in the city—Facebook, Amazon, and Apple have all signed new leases in the city since the start of the pandemic. Even amid the rise in remote work, the fact that these and other tech companies are putting down roots and adding new employees in the city is a highly encouraging sign for the city's future. But there's little doubt that New York leaders will need to acknowledge and address the still-developing trends around remote work.

"We're hiring nationwide," Michael Carvin, co-founder and CEO of the Nolita-based fintech firm SmartAsset, told *Crain's New York* in January. "It's unclear what is going to make a company a New York company going forward. We'll always have been founded in New York, and we will always be unbelievably proud of that. But I don't really think of us going forward as a New York company."

Other cities are making a play for entrepreneurs and innovators

Concurrent with the rise of remote work has come a renewed push by other cities to attract tech companies and talent. While the inevitable growth technology-focused jobs across the country is not inherently bad for New York, CUF's research finds that the city is not immune to the competitive challenge posed by other cities.

For instance, our analysis of labor market data shows that while employment in computer systems design, the largest industry within the broader tech sector, is up 1.3 percent since December 2019, that same industry has grown 6.9 percent nationally. While VC investment in New York companies boomed in 2021, emerging competitors including Miami and Philadelphia have seen faster growth in terms of both dollars invested and deals made.

Other cities are making concerted pushes to grow their own tech sectors and, if possible, poach companies and workers from larger hubs like New York. A LinkedIn report from May 2022 found that Miami gained the most workers in the last 12 months from New York City; for every 10,000 LinkedIn members in the [Miami-Fort Lauderdale area](#), 15.81 workers moved to the city in the last year from [New York City—nearly seven times the migration rate from any other city](#).²⁶

There have been high-profile departures from New York to Florida since the pandemic began. Blockchain.com, the crypto-focused news site, left New York for downtown Miami. Founder Peter Smith credited Miami's role as "the gateway to Latin America," its location "on the East Coast time zone," and that it is "probably the most excited city in the world about crypto right now." Job search startup Teal moved its corporate headquarters from New York City to Miami in early 2021. Ryan Feit, co-founder of New York-based equity crowdfunding platform SeedInvest, moved to Miami in 2021 after announcing the company was opening an office there. And Mitali Saxena, whose company Fashom uses AI to provide style recommendations for women, liked the talent and community available in New York, but when she needed warehouse space for inventory, she decided to relocate to Miami.

"It was the next best place with tech, community and a little bit cheaper in terms of resources," says Saxena. She now has five staffers in Miami, and 11 that are remote, four of which are in New York. She has still had to go to New York for meetings with funders and would return if she had the funding, but she says she's found community and support for women entrepreneurs in Miami, and the smaller size of the community has felt easier to navigate.

Grappling with an unwilling city bureaucracy is a challenge

There have been no shortage of high-profile fights between disruptive tech companies and city government, be they over rideshare, food delivery services or short-term apartment rentals. While there are legitimate policy debates or safety concerns underpinning these fights, the challenges of navigating New York's complex bureaucracy often come down to more mundane examples of miscommunication or inflexibility.

The battery storage company MicroGrid Networks, for example, is working with Con Edison to build energy-storage systems that take strain off the utility's substations. But they've struggled to navigate permitting processes and land use restrictions with a variety of agencies.

"These are technical and complicated projects," says Emmerick Patterson of MicroGrid Networks. "And we spend time and money and energy training DOB [Department of Buildings] reviewers on our energy storage technology. Then by the time we're done, there's turnover and we need to train a new set of people. Some projects are taking over two years to permit, and really there's no end in sight for others. A lot of it is getting stuck between DOB and FDNY [Fire Department of New York], which are not fully positioned to invite change and innovation into their processes. There needs to be some leadership that helps drive these projects forward."

The willingness of city leadership to experiment with new tools in creative, open-minded ways can have a major impact on projects, even in areas specifically designated to such experimentation. The leadership of the Brooklyn Navy Yard, for example, developed a program to pilot autonomous vehicles in the enclosed campus, an effort that had buy-in from local and industry stakeholders along with key members of city government. But hesitancy from City Hall itself stretched what should have been a six-month approval process to nearly two years, nearly derailing the project, says an executive familiar with the project who requested anonymity to speak frankly, given that her firm has ongoing relationships with government agencies.

"It was just a slog," says the company executive. "It happened, but it felt like it didn't need to be so fraught."

Even tech-focused programs launched by the city itself can get mired in bureaucratic issues. Some of the winners of the city's annual BigApps competition, for example, went on to become viable companies, like JustFix.NYC or MyCityWay. But others didn't, says Minerva Tantoco, a consultant and entrepreneur who was the city's chief technology officer from 2014 to 2016, in part because the city's own procurement rules prevented agencies from working with the startups.

"There were some good ideas, but really no way for the city to buy that technology because of the tech procurement process," she says. "The way the city acquires technology, they want to work with stable, established companies. They don't want to buy software from a company that's gone in six months. Totally makes sense, but it tends to favor large providers and not young upstart companies."

New challenges around early-stage financing are making it tougher for firms to get their start than in years past.

While there is no shortage of venture capital money in New York, in our conversations with industry leaders, we heard that the constant churn of angel investors and early-stage funding opportunities is difficult for young entrepreneurs to navigate.

In 2021, early-stage investments accounted for just 57 percent of all venture deals, lower than any other year, according to data from CB Insights. Meanwhile, Los Angeles and Miami saw their early-stage deal share reach a record high. While many start-ups struggled to land larger funding rounds in New York a decade ago, the landscape has shifted today.

"There's an issue of early-stage financing either churning, disappearing, getting bigger or just being too under the radar," says Charlie O'Donnell, founder of seed and pre-seed venture firm Brooklyn Bridge Ventures. "What does New York's angel community look like? Many will do ten deals, and then they realize how much money they've sunk in. Or they start getting busy and they're just not in the ecosystem anymore. Funds like mine typically get bigger, they have success, they go institutional."

Hiring skilled tech talent remains a constant struggle

From fast-growing companies to five-person start-ups, company leaders interviewed for this report all agreed that hiring challenges have only grown in recent years. Across the industry, there is increasingly high demand for engineers with experience in back-end development and open-source coding languages, advanced machine learning and data science, mobile technologies, and cybersecurity, says Matt Stabile, VP of data science and analytics recruiting for Averity, a New York-based tech recruiting firm founded in 2014. For nearly all those roles, Stabile says, demand is higher than supply. "Those folks are just really hard to find right now, and they command very high salaries," he says. When asked which roles employers were most struggling to fill, he says, "You could arguably say that for all the roles we're working on."

The growing demand for talent in New York's tech ecosystem can pose a particular challenge for smaller firms, who are competing against much bigger companies for the same pool of talent, as well as against financial institutions and other industries who are increasingly hiring highly skilled tech workers.

"There is still a major pipeline challenge," says Crichton of Lux Capital. "New York City has engineering schools. There's Cornell Tech, there's Columbia, NYU Tandon. But it does not have a Stamford, Harvard, MIT, or Carnegie Mellon. You particularly notice it at graduate level. There are some great programs here. But it is not commensurate with the scale of New York City."

The sector is not immune to the city's broader challenges with affordability and quality of life

In many ways, the concerns we heard from tech sector leaders were those shared by many New Yorkers: that in the wake of the pandemic, New York has become a more challenging place to live, and that addressing issues like affordable housing, public safety and inequality are key to making the city a welcoming place for tech workers. "Housing, the cost of living, is probably one of the biggest factors for New York," says Skandul. "And I think that's how people will probably

make the determination as to whether or not they're going to stay in New York full time, part time, or if they'll leave."

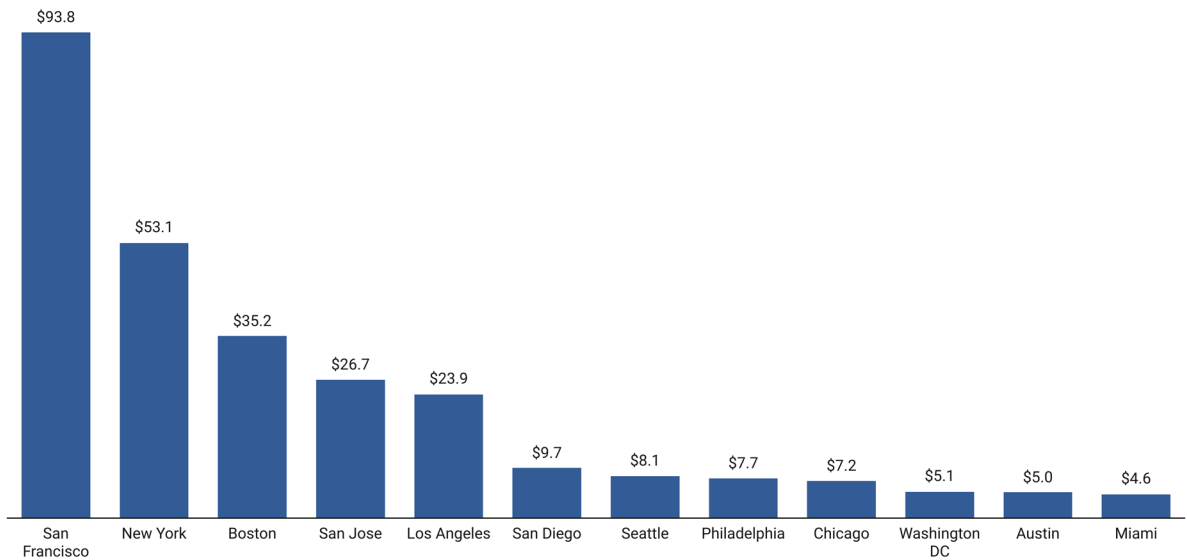
New York's tech employees may make high salaries, but that advantage is dampened by the expense that comes with living in New York. In fact, a recent report by the job search firm Hired ranked New York City dead last in how pay stacks up against the cost of living. A \$157,000 salary here is worth about \$243,000 in Dallas, \$234,000 in Austin, \$204,000 in Seattle, \$201,000 in Los Angeles, and \$190,000 in Boston, the report finds. This poses a particular challenge to young families struggling to afford space in the five boroughs.

But even those workers with financial stability are not entirely insulated to the struggles of those around them. The conversation around the impact of tech companies on society has changed drastically in the past decade. The [fight over Amazon HQ2](#) indicates that mounting frustration over the financial and social dominance of certain tech companies can have real, tangible consequences for New York City.²⁷ While New York's size and economic diversity means that "big tech" is unlikely to create the same types of tensions that have developed in smaller cities like Seattle and San Francisco, the city—and the sector itself—need to ensure tech companies are more deeply integrated into the fabric of the city through hiring and civic engagement. In other words, ensure tech is a tool for fighting inequality, rather than exacerbating it.

"This recovery has been asymmetric in the sense that, with work from home, white-collar, college-educated workers can do their jobs on Zoom," says Chowdhury. "In many ways, the tech ecosystem hasn't missed a beat. But this could quickly become a place where that inequality could increase. In order to prevent that, the city really needs to champion ways to make it more inclusive. To give people from backgrounds that have been underrepresented more skills training, so that they can be a part of this new workforce, rather than expecting them to go back to a tourism job or a restaurant job."

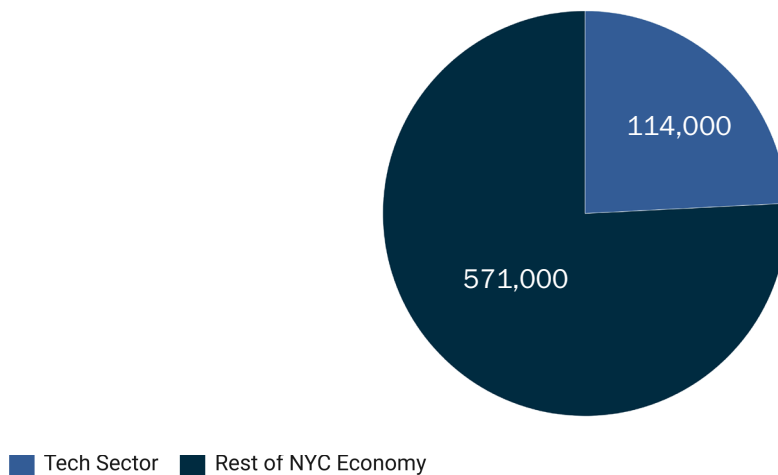
Data from NYC's New Jobs Engine

Top U.S. Metro Areas for VC Investment, 2021 (in billions)



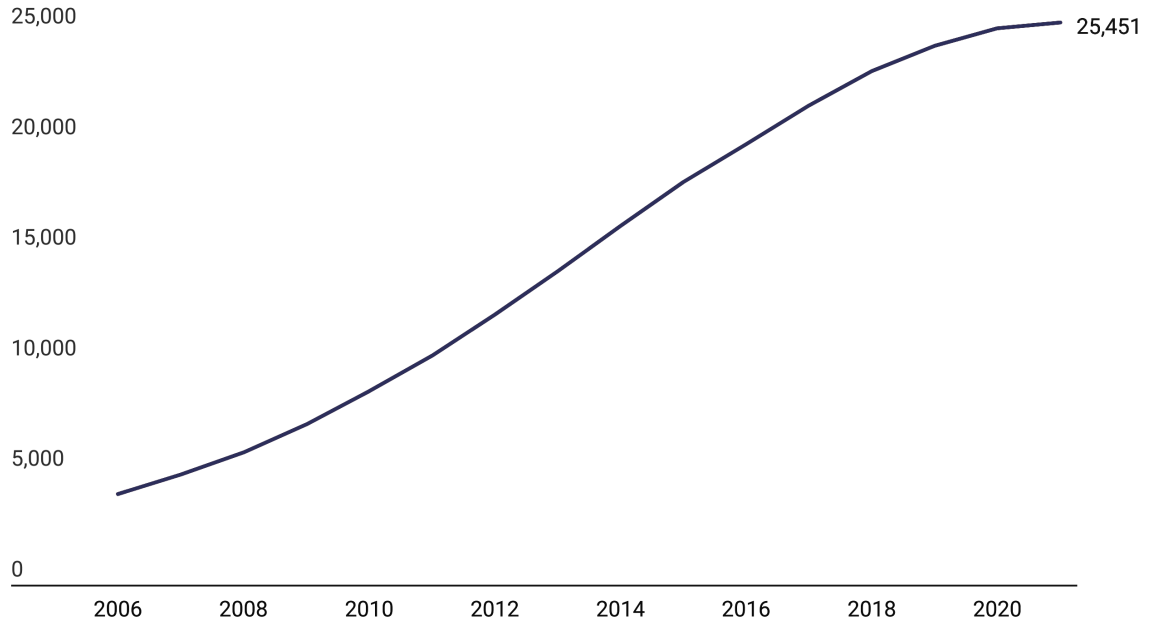
Source: Center for an Urban Future analysis of data from Crunchbase
Created with Datawrapper

Tech Sector's Share of All Private Sector Job Growth in NYC, 2010–2021



Source: Center for an Urban Future analysis of data from the Quarterly Census of Employment and Wages.
Created with Datawrapper

Growth in NYC Tech-Enabled Start-Ups



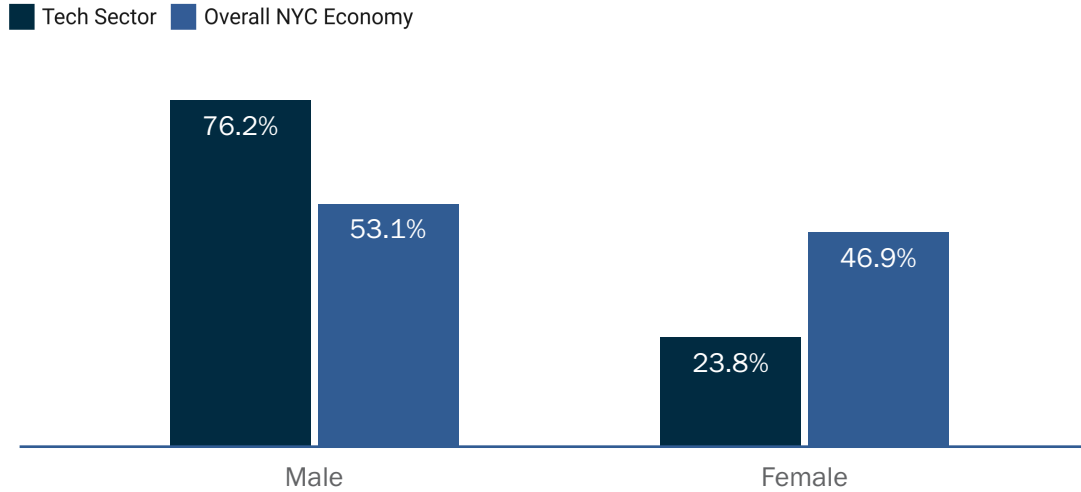
Source: Center for an Urban Future analysis of data from Crunchbase
Created with Datawrapper

NYC Tech-Enabled Start-Ups by Borough

Borough	2011	2016	2021
Bronx	51	84	103
Brooklyn	1,024	2,018	2,599
Manhattan	9,022	17,360	22,199
Queens	236	398	456
Staten Island	56	88	94

Source: Center for an Urban Future analysis of data from Crunchbase
Created with Datawrapper

Gender of NYC Tech Sector Workforce



Source: Center for an Urban Future analysis of data from the 2019 American Community Survey 5-Year-Estimates
Created with Datawrapper

Race and Ethnicity of Tech Workforce by City

Group	NYC	SF Bay Area	Boston/Cambridge	Seattle	Los Angeles
Other	3.0%	5.0%	3.5%	3.9%	3.5%
Black	9.4%	2.3%	3.4%	2.2%	5.3%
Hispanic	11.4%	6.2%	6.3%	4.5%	17.0%
Asian	29.7%	50.6%	20.5%	33.2%	33.8%
White	46.6%	37.7%	66.3%	56.2%	40.4%

Source: Center for an Urban Future analysis of data from the 2019 American Community Survey 5-Year-Estimates
Created with Datawrapper

Gender of Tech Sector Employment by City

Gender	NYC	SF Bay Area	Boston/Cambridge	Seattle	Los Angeles
Male	76.2%	75.9%	73.2%	79.4%	73.6%
Female	23.8%	24.1%	26.8%	20.6%	26.4%

Source: Center for an Urban Future analysis of data from the 2019 American Community Survey 5-Year-Estimates
Created with Datawrapper

Source: Center for an Urban Future analysis of data from the 2019 American Community Survey 5-Year-Estimates
Created with Datawrapper

Recommendations

Strengthening the Tech Sector as NYC's New Jobs Engine

HELP NYC CONTINUE TO ATTRACT AND RETAIN TALENT BY PRIORITIZING INVESTMENTS IN TRANSIT, PARKS, SAFETY, AND CULTURE. Nothing has been as crucial to New York's remarkable rise as a tech hub in recent decades than the city's ability to attract and retain highly educated, creative, and entrepreneurial people. Simply put, tech companies big and small have chosen to locate and grow in New York, despite the nation's highest costs of doing business, because of the city's unparalleled pool of tech talent. Similarly, nothing would be more harmful to New York's future growth prospects in tech than losing the city's steady pipeline of talented tech workers. The most important thing city leaders can do to continue attracting and retain this workforce is by making investments that keep New York eminently livable, vibrant, safe, and easy to get around. This means boosting subway service, expanding and improving parks and open spaces, growing the city's bike infrastructure, ensuring cultural vibrancy, and keeping the city's streets safe and clean.

CREATE A PLAN TO DOUBLE EMPLOYMENT IN THE CITY'S TECH SECTOR BY 2030. No other part of New York City's economy has as much potential to add well-paying jobs in the years ahead, but it's not a given that all this growth will occur. The Adams administration should develop a long-term strategy to ensure that New York realizes this considerable potential. Although city government isn't going to double the size of New York's tech sector, the wrong economic development, regulatory, and legal policies could cause the city to miss out on the sector's extraordinary potential for future job growth.

MAKE THE TECH SECTOR A CENTRAL PILLAR OF NYC'S ECONOMIC DEVELOPMENT STRATEGY. The city's economic development policies should be recalibrated to reflect the fact that the tech sector has become the leading driver of New York's economic growth. Although tech has long been part of the city's economic development policies, it's time to elevate the sector's role in those efforts.

CREATE A TEAM AT NYCEDC FOCUSED ON HELPING NYC CAPTURE SIGNIFICANT MARKET SHARE IN SEVERAL EMERGING TECH SUB-INDUSTRIES. New York has the potential to become a national or global leader in several emerging tech sub-fields, from blockchain and women's and family tech to augmented reality and wellness. NYCEDC should create new staff resources to nurture and support these and other fields within the broader tech sector that have considerable potential for future job growth. This might be modeled after the "industry desk" system that NYCEDC used in prior years, in which dedicated staff were assigned to a sector—including life sciences, finance, media, and fashion—and charged with building relationships with industry leaders, understanding key challenges and opportunities facing the sector, and developing specially tailored programs and initiatives to support the sector. Under a new model, NYCEDC might assign staff to several different tech sub-industries, each of which faces unique challenges and opportunities.

POSITION NEW YORK TO BECOME AN UNMATCHED PLACE FOR REMOTE AND HYBRID WORK. While companies across the economy are adopting elements of remote and hybrid work, the uptake rate has been considerably higher in the tech sector. The fact that so many tech employees are opting to work from their homes doesn't necessarily mean that New York will lose out, but it could spell problems over the long term if a growing share of New York's tech employees decide to move elsewhere. New York City should get ahead of this trend, and make a series of infrastructure investments and policy decisions that enable New York to become the best place in the nation for remote and hybrid work. This might include investing in new pocket parks and open spaces in residential neighborhoods to make working from home in New York an even more attractive experience, and streamlining rules that make it easier for property owners in commercial strips outside of Manhattan to convert first or second-floor retail spaces into hubs for communal office work. It could also involve working with real estate leaders to ensure the development of new spaces in the city's central business districts that aren't offices but rather places that enable companies and workers to meet and build "connective fiber," as urbanist Richard Florida has suggested.

MAKE NYC A TEST BED FOR NEW TECHNOLOGIES. Nearly 40 percent of the companies operating at Newlab today relocated from outside of New York State. According to Newlab CEO Shaun Stewart, many of them opted to build their business here specifically because the Brooklyn Navy Yard is one of the only places in New York where early-stage companies can test their technology. Nearly everywhere else across the five boroughs, however, city regulations and rules make it incredibly difficult to launch the type of pilots that occur regularly in the Navy Yard—from testing pipe inspection devices under the buildings to piloting amphibious drones in the East River. City officials should change this and work with Business Improvement Districts (BIDs) and other community stakeholders to designate specific neighborhoods as spaces where startups can safely pilot urban tech like micromobility and autonomous vehicles, agriculture and food tech, and even certain types of manufacturing or quantum computing. The Downtown Brooklyn Partnership's Living Lab initiative can serve as a model. Doing so would make New York attractive to entrepreneurs in the city and around the globe who are building the fast-growing companies of tomorrow.

MAKE IT EASIER FOR STARTUPS TO WIN CITY TECHNOLOGY CONTRACTS. New York is the world's second leading startup tech hub, but the city's own procurement policies make it extremely difficult for any of the city's small and mid-sized tech startups to compete for technology contracts. City officials should change this, re-evaluating its RFP system and eliminating barriers for small, local firms to win city contracts. Doing so would create powerful new growth opportunities for city startups, and potentially improve the effectiveness and efficiency of city government.

STEP UP EFFORTS TO ATTRACT INTERNATIONAL TECH COMPANIES TO NYC. It's crucial that New York nurture the entrepreneurs and founders that are already here in New York, but the city can augment this job growth by becoming even more of a magnet for innovators to set up shop here. Although several dozens of tech companies from around the globe have either relocated to New York or established their American office here, many believe there is significant untapped potential. A concerted effort from NYCEDC could make a difference.

LAUNCH A BOLD NEW CITY EFFORT TO EXPAND ACCESS TO TECH JOBS. While the tech sector has become the city's most reliable source of new well-paying jobs, far too few New Yorkers of color have been able to access these jobs. To help change this, Mayor Adams should launch a bold, long-term plan to expand and improve the tech skills-building ecosystem, backed up by significant new public investment. This should include both an expansion of tech-focused training programs for adults and K-12 computing education. More specifically, we recommend prioritizing the following actions:

- **SCALE UP THE CITY'S MOST EFFECTIVE TECH TRAINING PROGRAMS.** While the city is home to exemplary career training organizations, too many of them serve only a few dozen or a few hundred New Yorkers each year. The Adams administration should provide new funding to expand these best-in-class tech training programs. This might include launching a "Race to the Top"-style competitive grant program that allows city officials to provide the most competitive applicants with new city funding that is separate from the city's current pool of workforce dollars, which largely comes from the federal government and is highly restrictive in how it is used.
- **CREATE NEW BRIDGE PROGRAMS, WHICH PROVIDE CRUCIAL ON-RAMPS TO EFFECTIVE TECH TRAINING PROGRAMS.** Currently, tens of thousands of New Yorkers struggle to gain admittance to the best tech training programs because of gaps in literacy, math skills and digital fluency—including the more than 1 million adults without a high school diploma. Bridge programs help the most economically vulnerable New Yorkers to get on the path to tech careers.
- **ESTABLISH HUNDREDS OF NEW TECH APPRENTICESHIPS.** Apprenticeships are a proven model for helping people without college credentials launch into the middle class, but the city is home to fewer than 100 apprenticeships in tech companies today. The Adams administration should with tech employers, CUNY, and nonprofit training providers to launch dozens of new tech apprenticeships—building on tech apprenticeships and "apprenticeship-like" models in the tech sector that are already working.
- **HARNESS THE CITY UNIVERSITY OF NEW YORK AS A LAUNCHPAD INTO TECH CAREERS.** CUNY is well-positioned to help thousands more New Yorkers of color to access careers in the tech sector. But new city investment is needed to enable CUNY's continuing-education programs to hire industry professionals, expand career services, cultivate industry partners, upgrade technology and learning labs, and boost counseling and wraparound supports.
- **BUILD ON THE SUCCESS OF NYC'S COMPUTER SCIENCE FOR ALL INITIATIVE.** Since its launch in 2015, the city's CS4All initiative has embedded computer science education in more than 825 public schools. Mayor Adams should champion the program's expansion to reach every public school student by 2025 and ensure that Department of Education (DOE) has the institutional support and accountability to keep on pace.
- **EXPAND COMPUTING EDUCATION IN GRADES K-5.** Early exposure to foundational computing education can help close achievement gaps for low-income students and shape early attitudes toward technology careers, but current offerings are extremely limited. The Adams administration should launch a vision for universal computing education.
- **INVEST IN TEACHER TRAINING IN COMPUTING EDUCATION.** For both K-12 schools and tech skills-building organizations focused on serving working adults, finding and developing skilled instructors poses a growing challenge. The city should invest in professional development and pre-service training in computing education, building on a promising pilot program at CUNY. That way, every teacher can gain the tools needed to integrate computational thinking into their classrooms.

ENDNOTES

1. This report finds that New York City's tech sector now employs 194,000 people, as of December 2021. But that figure was arrived at using the Federal Reserve Bank of New York's narrow definition for measuring employment in the tech sector that almost certainly undercounts the true size of sector. Other analyses have found that the broader "tech ecosystem" in New York employs 372,000 people.
2. To examine the racial/ethnic and gender composition of employment in each city's tech sector, we analyzed 17 tech-specific occupations, such as database administrators, web developers, and computer network architects, using data from the 2019 American Community Survey.
3. Crain's New York Business, "The tech sector will grow ... elsewhere?" January 10, 2022.
4. sf.citi, "Tracking San Francisco's Tech Exodus," March 2022, <https://sf.citi.org/sf-tech-exodus>.
5. This report finds that New York City's tech sector now employs 193,929 people, as of December 2021. But that figure was arrived at using the Federal Reserve Bank of New York's narrow definition for measuring employment in the tech sector that almost certainly undercounts the true size of sector. Other analyses have found that the broader "tech ecosystem" in New York employs 372,000 people.
6. CUF's measurement of the sector's employment aggregates job totals in seven industries "in which firms use technology as their core business strategy": Computer Manufacturing, Electronic Shopping, Software Publishing, Data Processing & Hosting, Internet Publishing & Broadcasting & Web Search Portals, Computer Systems Design and Scientific R&D Services.
7. CUF analysis of data from Crunchbase, a leading global database that tracks tech-enabled start-ups using a mix of public, private, and self-reported sources. Analysis is for 2011 and 2021.
8. Analysis of U.S. Bureau of Labor Statistics, QCEW data set. In 2010, the Internet publishing and web search portals in New York County had 410 firms employing 7,214 people and in 2020 it had 752 firms employing 43,615.
9. Economic impact analysis by the Bay Area Council Economic Institute, using the IMPLAN model, and shared with the authors.
10. Market capitalization figures as of May 24, 2022.
11. CUF analysis of data from Crunchbase.
12. *Crain's New York Business*, "Inside a red-hot year for New York tech IPOs," June 25, 2021, <https://www.craainsnewyork.com/technology/inside-red-hot-year-new-york-tech-ipos>
13. CUF analysis of data from Crunchbase.
14. Richard Florida, "The Post-Pandemic Geography of the U.S. Tech Economy," Bloomberg City Lab, March 9, 2022.
15. Measures NYC's share of national employment in the "Internet publishing and web search portals" industry.
16. Richard Florida.
17. Kim-Mai Cutler, "Post-Pandemic Silicon Valley Isn't a Place," Initialized, January 21, 2021, <https://blog.initialized.com/2021/01/data-post-pandemic-silicon-valley-isnt-a-place>.
18. Accenture Research and Tech:NYC, "NYC Tech Hiring Trends, May 2022," <https://www.accenture.com/content/dam/accenture/final/industry/high-tech/document/Accenture-research.pdf>.
19. Nicolás Rivero, "Miami's tech boom started with a tweet but is sustained by more than hype," Quartz, December 4, 2021, <https://qz.com/2098280/miamis-tech-scene-is-still-booming-after-a-year-of-hype>.
20. CUF analysis of data from the U.S. Census Bureau 2019 American Community Survey.
21. Alex Irwin-Hunt, "The global map of venture capital-powered FDI," fDi Intelligence, June 26, 2020, <https://www.fdiintelligence.com/content/rankings-and-awards/the-global-map-of-venture-capital-powered-fdi-77759>.
22. Jordan Rubio and James Thorne, "Top 50 college for founders," PitchBook, November 17, 2021, <https://pitchbook.com/news/articles/2021-pitchbook-university-rankings-top-50-colleges-founders>.
23. Justin Olander and Melissa Flagg, "AI Hubs in the United States," Georgetown Center for Security and Emerging Technology, May 2020, <https://cset.georgetown.edu/publication/ai-hubs-in-the-united-states>.
24. Accenture Research and Tech:NYC.
25. Partnership for New York City, "Return to Office Survey Results," May 2022, <https://pfny.org/research/return-to-office-survey-results-may-2022>.
26. LinkedIn Workforce Report for Miami/Fort Lauderdale, May 2022, <https://www.linkedin.com/jobs/blog/linkedin-workforce-report-may-2022-miami-fl?src=or-search&veh=www.google.com%7C%2Fsearch>
27. See J. David Goodman, "Amazon Pulls Out of Planned New York City Headquarters," *New York Times*, February 14, 2019, <https://www.nytimes.com/2019/02/14/nyregion/amazon-hq2-queens.html>.

